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PATENT FILING TRANSMITTAL

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Box Patent Application
Commissioner of Patents and Trademarks
Washington, D.C. 20231

PATENT FILING TRANSMITTAL

Transmitted herewith for filing is the Patent Application of: **Akihiro Urano, Kenichi Yoshida, Shigeru Miyake, Toshiaki Hirata, Masaaki Oya, Atsushi Mitomi**

For: **INTEGRATED DATABASE SYSTEM AND METHOD FOR ACCESSING A PLURALITY DATABASES**

TYPE OF FILING

This new patent application is for a(n):

[X] Utility
[ ] Design
[ ] Plant
[ ] Divisional
[ ] Continuation
[ ] Continuation-in-part

Benefit of a prior filed application

☐ This application claims the benefit of an earlier filed U.S. Patent Application under 35 USC 120.

☒ Please accord Applicant the benefit of the priority date of June 23, 1999 to this case pursuant to 35 USC 119. Applicant's claim for priority is based on application 11-176412 filed in Japan on that date.

Filing under 37 CFR 1.53 (Utility) or 37 CFR 1.153 (Design)

☒ This is an application filed pursuant to 37 CFR 1.53 or 37 CFR 1.153, permitting receipt of a filing date upon filing of a specification, at least one claim and necessary drawings.

☒ In the event any parts of this application are incomplete, please treat this as a filing under 37 CFR 1.53 or 37 CFR 1.153.

CERTIFICATE OF MAILING (37 CFR 1.10(a))

CERTIFICATE OF MAILING BY "EXPRESS MAIL" - Rule 10: I hereby certify that this correspondence is being deposited with the U. S. Postal Service "Express Mail Post Office to Addressee" Service under 37 CFR 1.10 as Express Mail No _____ addressed to the Commissioner of Patents & Trademarks, Washington, D.C. 20231 on _____ by _____.

Date:_____ Signed:_____

ENCLOSURES

Minimum requirements under 37 CFR 1.53(b) (Utility) or 37 CFR 1.153 (Design)

- [X] 17 pages of specification;
- [X] 10 pages of claims;
- [X] 1 -page(s) of abstract;
- [X] 6 sheets of informal drawings;
- [X] A Declaration, Power of Attorney & Petition or listing of inventors;

and

- [X] A postcard for return to us as proof of receipt of the above documents.

plus

- [ ] An Assignment of the invention to ____ and Assignment cover sheet;
- [ ] Verified Statement Claiming Small Entity Status (37 CFR 1.9(f) and 1.27(b))
- [ ] Form PTO-1449 (IDS) and copies of the references listed thereon;
- [ ] A certified copy of _____ (country) patent application number 8-236494 (priority document).
- [ ] A preliminary amendment;
- [ ] Declaration of Biological Deposit;
- [ ] Submission of sequence listing, computer readable copy and/or amendment relating thereto for biotechnology invention containing nucleotide and/or amino acid sequence;
- [ ] An associate power of attorney;
- [ ] Other.

DECLARATION OR OATH

The enclosed Declaration or Oath has been executed by:

- [ ] Inventor(s);
- [ ] Legal representative of the inventors (37 CFR 1.42 or 1.43);
- [ ] Joint inventor or person showing proprietary interest on behalf of an inventor who refused to sign or who cannot be reached and this is a petition required by 37 CFR 1.47 and the statement required by 37 CFR 1.47 is attached;
- [X] Has not been executed and is enclosed for the purposes of identifying the inventors.

INVENTORSHIP STATEMENT

The inventorship for all the claims in this application is:

- [X] the same;
- [ ] not the same and, as an explanation, a statement is/will be submitted.

LANGUAGE

The application submitted herewith is:

- [X] in English;
- [ ] in not in English and in terms of 37 CFR 1.52(d) a verified translation is
  - [ ] attached
  - [ ] not attached.

FEE CALCULATION

The filing fee has been calculated as shown below:

	SMALL ENTITY	OR	OTHER THAN A SMALL ENTITY
BASIC FEE Design Patent	$155		$310
BASIC FEE Utility Patent	$345		$690
EXTRA FEES	RATE FEE		RATE FEE
TOTAL CLAIMS 15 MINUS 20 = 0	x 9 = $		x 18 = $
INDEP.CLAIMS 5 MINUS 3 = 2	x 39=$		2 x 78 = $ 156
☐ MULTIPLE DEP. CLAIM	+130= $		+260 = $
☐ ASSIGNMENT	+ 40 = $		+ 40 = $
☐ RULE 53 SURCHARGE	+ 65 = $		+130 = $
TOTAL	$ 0		$746.00

FEE PAYMENT

☒ No fee is enclosed.

☐ Attached is Check No. ____ in the sum of $ ____ to cover the application fee and if possible, the assignment fee.

☐ Please charge Account No.19-2825 the sum of $_____.

FEE DEFICIENCY

☐ The Commissioner is authorized to charge (or credit any overpayment) to deposit account No.19-2825:

- ☐ Any additional filing fees required under 37 CFR 1.16, except Rule 53 filings, which will be paid within the time permitted by PTOL 1533.
- ☐ Assignment Recordal fees.

☒ The filing fee and surcharge under 37 CFR 1.16, patent application processing fees under 37 CFR 1.17 and patent issue fees under 37 CFR 1.18 are intended to be paid by our firm as they arise. As no abandonment is intended by any inadvertent nonpayment of fees, the Commissioner is hereby authorized to charge payment of such fees as from time to time come due, if not paid prior to due date to our Deposit Account No. 19-2825.

☐ A duplicate copy of this sheet is enclosed.

Dated: 6/22/00

Respectfully submitted,

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s)	:	Urano et al.
Serial No.	:	Not yet assigned
Filed	:	June 22, 2000
For	:	INTEGRATED DATABASE SYSTEM AND METHOD FOR ACCESSING A PLURALITY OF DATABASES

EXPRESS MAIL CERTIFICATE

Express Mail Label No. EL599411626US

Date of Deposit June 22, 2000

I hereby certify that the following attached paper(s) or fee

1) Patent Application (specif.-17pgs, claims-10 pgs.)
2) Informal Drawings (6 sheets)
3) Patent Transmittal
4) Return Postcard
5) Express Mail Certificate
6) Declaration-executed

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Deposited Date

TITLE OF THE INVENTION

INTEGRATED DATABASE SYSTEM AND METHOD FOR ACCESSING A PLURALITY OF DATABASES

This application claims priority from Japanese Patent Application Reference No. 11-176412, filed on June 23, 1999, the entire content of which is incorporated herein by reference for all purposes.

BACKGROUND OF THE INVENTION

The present invention relates to the technique of efficiently accessing plural databases on a network system.

There are some cases in which plural database servers are provided on a network system. The plural database servers provide users on the network with their stored objects, and each of the database servers manages its own stored objects independently of the other database servers.

Directory databases are known which provide users on a network system with information such as the addresses of individuals or organizations on the network system. One example of such directory databases is an LDAP server which is described in "LDAP: Programming Director-Enabled Applications with Lightweight Directory Access Protocol" (MacMillan Technology Series), written by Tim Howes and Mark Smith, published by Macmillan Technical Publishing,

ISBN 1578700000.

In a case where plural independent databases are present on a network system, if a user is to access a particular object stored in a particular database server, the user needs to specify the particular database and the particular object.

Before accessing the object, the user must be burdened with looking into the database server in which the object is stored.

SUMMARY OF THE INVENTION

The present invention makes it easy to access a particular object stored in a particular database server in a case where plural independent databases are present on a network system.

The present invention provides, for example, an integrated database system which includes a plurality of database systems connected to one another through a network, each of the plurality of database systems managing its own stored data independently of the other database systems and accessing the stored data in accordance with an access request, and an integrated database unit connected to the network.

The integrated database unit includes:

a directory database which stores a correspondence between each of the data stored in the plurality of

database systems and a database system in which each of the data is stored;

a database identifying means which identifies a database system stored in the directory database in accordance with target data of an access request issued by a user; and

a data access means which accesses the target data of the access request issued by the user, by issuing the specified database system with a request to access the target data of the access request issued by the user.

According to the integrated database system, if the integrated database unit receives an access request from a user, the integrated database unit refers to a directory database and identifies a database system in which target data of the access request is stored, and issues an access request to the database system and accesses the target data of the access request issued by the user. Accordingly, if the user only issues an access request to the integrated database unit once, the user can access data. The user can access the data without being aware of which database system stores the data.

According to the present invention, in the integrated database system, for example, each of the database systems manages each data by using a local data name which is an identifier unique to each data in the database system itself, and accepts an access to data corresponding to a

local data name, in accordance with an access request which specifies the local data name. The directory database stores, as to each of the data stored in the plurality of database systems, a correspondence with the database system in which each of the data is stored, a local data name of each of the data and a global data name which is an unique identifier for each data in all of the plurality of databases. The database identifying means receives an access request which specifies a global data name of target data of the access request from the user, and identifies a database system and a local data name which correspond to the received global data name and are stored in the directory database. The data access means issues the identified database system with an access request which specifies the identified local data name, and accesses the target data of the access request issued by the user.

As described above, according to the present invention, the integrated database unit manages the correspondences between global data names and local data names by means of a directory database, and receives a data access request from a user on the basis of a global data name and performs conversion between the global data name and a local data name, thereby accessing the database.

Accordingly, even if the same local data name occurs in each of a plurality of independent databases, the user can readily access the desired data that the user specifies

on the basis of a global data name.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be more apparent from the following detailed description, when taken in conjunction with the accompanying drawings, in which:

Fig. 1 shows a configuration of a network system according to a preferred embodiment of the present invention;

Fig. 2 shows one example of the hardware configuration of each computer according to the preferred embodiment of the present invention;

Fig. 3 shows directory information according to the preferred embodiment of the present invention;

Fig. 4 shows the functional configurations of server computers according to the preferred embodiment of the present invention;

Fig. 5 shows steps of a process to be performed by each of the server computers according to the preferred embodiment of the present invention; and

Fig. 6 shows one example of a signal sequence between each part according to the preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

One preferred embodiment of the present invention

will be described below.

Fig. 1 shows the configuration of a network system according to the present embodiment.

Referring to Fig. 1, a console computer 101 is a computer through which an operator performs management of a system, such as monitoring of the operational status of the system. A server computer 111 is a computer for operating and monitoring the entire system, and includes a directory database 112 in which directory information is stored, and a database 113 in which information as to a server computer 111 and the like is stored as objects.

The server computer 121 includes a database 123 in which various kinds of information as to the server computer 121 itself as well as computers 124 and 125 are stored as objects, and the server computer 131 includes a database 133 in which various kinds of information as to the server computer 131 itself as well as computers 134 and 135 are stored as objects.

All of the computers are connected to one another by local area networks and communication lines.

The hardware configuration of each of the computers may use a general hardware configuration of an electronic computer of the type which is shown in Fig. 2 by way of example.

The hardware configuration may be used including a central processing unit 302, a main memory 301, a network

control unit 303 which controls the input and output of data to and from networks such as communication lines and a local area network, a disk unit 306, a disk control unit 307 which controls the input and output of the disk unit 306, a display unit 308, a display control unit 309 which controls the input and output of the display unit 308 and the like. The computers other than the console computer 101 need not necessarily include the display unit 308 and the display control unit 309.

The central processing unit 302 executes modules or codes which constitute a program loaded into the main memory 301 from the disk unit 306, whereby each of parts which will be described later with reference to Fig. 4 is formed on the computer as a process and each of operations which will be described later is carried out. The program may be of a type which is recorded on a recording medium such as a CD-ROM and is read by a driver (not shown) and stored in the disk unit 306, or of a type which is supplied through a network and stored in the disk unit 306.

Each of the databases 113, 123 and 133 is a repository database made of a relational database or other object-oriented database, and stores, as objects or various kinds of information as to the corresponding computers, system information as to the corresponding computers, the definitions of jobs, calendar information, the definitions of the operational schedules of jobs, the operational

histories of jobs.

The directory database 112 has the directory of each of global object names which are given to the respective objects stored in each of the databases 113, 123 and 133, so that each of the global object names becomes unique in all of the databases 113, 123 and 133. The directory database 112 stores, as the information of the directory of each of the global object names, an identifier of a computer including a database in which an object having the corresponding global object name is stored, and a local object name which is a unique identifier given to identify the object on the database in which the object is stored.

Fig. 3 shows the information of directories stored in the directory database 112.

Referring to Fig. 3, reference numeral 501 denotes the information of a directory corresponding to an object which is the calendar information of the computer 111. The information 501 includes a global object name, as "DN" 502 being an identifier of the directory, which is given to the calendar information of the computer 111 so that the calendar information is made unique on the system; an identifier, as "database" 503, which is given to the computer 111 so that the computer 111 is made unique on the network system, the computer 111 having the database 113 which stores the object which is the calendar information of the computer 111; and an identifier, as "objectname"

504, which is the identifier of this object on the database 113.

Similarly, reference numeral 511 denotes the information of a directory corresponding to an object which is the calendar information of the computer 124. The information 511 includes a global object name, as "DN" 512 being an identifier of the directory, which is given to the calendar information of the computer 124 so that the calendar information is made unique on the system; an identifier, as "database" 513, which is given to the computer 124 so that the computer 124 is made unique on the network system, the computer 124 having the database 123 which stores the object which is the calendar information of the computer 124; and an identifier, as "objectname" 514, which is the identifier of this object on the database 124.

In the present embodiment, the domain name of such a computer is used as an identifier which is described in the database of the information of the directory and is given to the computer so that the computer is made unique on the computer network system. Each of the computers can access the others on the basis of their domain names by using a well-known domain name server. The method of describing such a domain name in the information of the directory may be an arbitrary method which enables identification of the domain name. For example, dc = hitachi, dc = co, dc = jp

may be set as a base directory, and dc = host111, sdl, dc = hitachi, dc = co, dc = jp may be described as the domain name of the server computer 111.

As the global object name which is described as "DN" in the information of the directory, i.e., as a global object name given to an object which is a particular kind of information of a particular computer, the domain name of the particular computer to which an identifier indicative of the particular kind is added may be used. In this case as well, the method of describing the domain name may be an arbitrary method as far as it enables identification of the domain name.

Fig. 4 shows the internal functional configuration of each of the server computers 111, 121 and 131.

Since the internal functional configuration of each of the server computers 121 and 131 may be the same, Fig. 4 shows the internal functional configurations of the server computers 111 and 121 with the server computer 131 omitted.

As shown, the server computer 111 has a repository API (Application Program Interface) unit 201, a repository control unit 202, a directory database control unit 203, a database control unit 205, a database client unit 206, a remote access unit 207, and a database server unit 208.

The server computer 121 has a database server unit 210.

The operation of the system will be described below

with reference to the steps of the process shown in Fig. 5 and the signal sequence between each of the parts in the process shown in Fig. 6.

If an operator specifies the global object name of an object which is the calendar information of the computer 124 and instructs to acquire the object to the console computer 101, the console computer 101 requests the server computer 111 to acquire the object with the global object name.

In the server computer 111, the repository control unit 202 receives this request from the console computer 101 through the repository API unit 201 (Step 401).

If the repository control unit 202 has previously acquired the directory information of the directory of the same global object name and has cached the information, the repository control unit 202 transfers the process to Step 407 (Step 402). However, if the storage location of the object has not yet been known, the repository control unit 202 causes the process to proceed to Step 403.

If the repository control unit 202 can cope with the request by using the information of the directory database 112 (for example, the request is to make an inquiry about the directory information of the object), the repository control unit 202 transfers the process to Step 421 (Step 403). However, in Step 403, if the request is to acquire the object, the repository control unit 202 cannot cope

with the request by using the information of the directory database 112, and causes the process to proceed to Step 404.

The repository control unit 202 inquires of the directory database control unit 203 as to the directory information of the object having the global object name which the repository control unit 202 has been requested to acquire (Step 404).

The directory database control unit 203 inquires of the directory database 112 as to the directory information of the global object name, and the directory database 112 returns directory information corresponding to the inquired global object name to the directory database control unit 203 (Step 405). This directory information includes, in accordance with the directory information shown in Fig. 3, the domain name (described as "database" in Fig. 3) of the server computer 121 having the database 123 on which the object of the specified global object name is present, and the object name (described as "objectname" in Fig. 3) on the database 123.

When receiving the information, the directory database control unit 203 returns this information to the repository control unit 202 (Step 406).

The repository control unit 202 to which the information has been returned caches this information in its internal cache, and issues the database control unit

205 with the information returned from the directory database control unit 203 and a request to acquire the object (Step 407).

The database control unit 205 determines whether the "DN" of the computer issued together with the request to acquire the object is the domain name of the server computer 111, and issues the database client unit 206 with the information issued together with the acquirement request and a request to acquire the object (Step 408).

The database client unit 206 specifies the object name issued together with the request to acquire the object, and issues a request to acquire the object to the database server unit of a computer having the computer's domain name issued together with the request to acquire the object. At this time, the database client unit 206 accesses a different computer by using the remote access unit 207 (Step 409).

In this case, since the computer 121 is a different computer as viewed from the computer 111, the database client unit 206 issues the request to acquire the object to the database server unit 210 included in the server computer 121.

The database server unit 210 accesses the database 123 and acquires the object corresponding to the object name issued together with the request to acquire the object, and returns the object to the database client unit

206 of the computer 111 which has issued the request to acquire the object (Step 410).

If the database server unit 208 of the computer 111 receives a request to acquire an object, from the database client unit 206 of the same computer 111, the database server unit 208 similarly accesses the database 113 and acquires the object having the object name issued together with the request to acquire the object, and returns the object to the database client unit 206 of the computer 111 which has issued the request to acquire the object.

The database client unit 206 to which the object has been returned from the database server unit 208 returns the object to the database control unit 205 (Step 411).

The database control unit 205 returns the object to the repository control unit 202 (Step 412). The repository control unit 202 returns the object to the repository API unit 201 (Step 413).

The repository API unit 201 returns the object to the console computer 101, and the console computer 101 presents the acquired object to the operator.

If the operator is to acquire the calendar information of the computer 124 again after the above-described process, since the directory information of the object corresponding to the calendar information of the computer 124 has been cached in the previous process, the decision condition at Step 402 is YES. Accordingly, the

repository control unit 202 omits Steps 403, 404, 405 and 406 and transfers the process to Step 407. Owing to this procedure, since it becomes unnecessary to access a directory database every time, it is possible to improve the overall processing speed.

In the above-described process, if the operator merely desires to know the directory information of an object corresponding to the information of the computer 124, the process transfers to Step 421 according to a conditional branch in Step 403. In Step 421, the repository control unit 202 instructs the directory database control unit 203 to check the information of the directory. Then, the directory database control unit 203 acquires the information of the directory from the directory database 112 (Step 422). Then, the directory database control unit 203 returns the acquired data to the repository control unit 202 (Step 423). The repository API unit 201 returns the information of the directory to the console computer 101, and the console computer 101 presents the acquired information of the directory to the operator.

In the above-described configuration, each of the database server units 208 and 210 of the respective computers 111 and 121 provides an object in accordance with not only a request to acquire an object, issued from the remote access unit 207, but also a request to acquire an object corresponding to a specified object name, issued

from an arbitrary computer.

Owing to the above-described operation, the operator, if he or she only knows the global object name of an object, can access the object without knowing a database on which the object is present nor the object name on the database.

In the above-described embodiment, the server computer 111 includes the directory database 112, and performs acquirement of an object corresponding to a global object name specified by a user and transfer of the object to the user. In addition, each of the server computers 121 and 131 may include a directory database and a configuration similar to that of the server computer 111 so that each of the server computers performs acquirement of an object corresponding to a global object name specified by a user and transfer of the object to the user. In this case, a plurality of directory databases can be prepared by duplicating the contents stored in one directory database.

Although the above description of the embodiment has been made in connection with a case in which a user acquires an object by using a global object name, the present invention can be applied to various other accesses to objects, such as updating of an object by means of a global object name.

As is apparent from the foregoing description, according to the present invention, in a case where plural

independent databases are present on a network system, it is possible to reduce the burden on users during access to a particular object stored in a particular database server.

While the present invention has been described in detail and pictorially in the accompanying drawings, it is not limited to such details since many changes and modifications recognizable to those of ordinary skill in the art may be made to the invention without departing from the spirit and the scope thereof.

WHAT IS CLAIMED IS:

1. An integrated database system, comprising:

a plurality of database systems connected to one another by a network, each of said plurality of database systems managing its own stored data independently of the other database systems and accessing the stored data in accordance with an access request; and

an integrated database unit connected to the network, wherein:

said integrated database unit includes:

a directory database which stores, as to each of the data stored in said plurality of database systems, a correspondence with directory information and a database system in which the data concerned is stored;

a directory control unit which acquires, by using said directory database, directory information corresponding to target data of the accepted access request;

a database identifying unit which identifies, by using said directory database, the database system corresponding to target data of the accepted access request; and

a database control unit which issues, on the basis of the acquired directory information, an access request to the database system having the target data of the accepted

access request, wherein:

the database system includes a database server unit which accesses a database in accordance with the access request issued by said integrated database unit.

2. An integrated database system according to claim 1, wherein:

said directory database stores correspondences between each of the data stored in said plurality of database systems and the database system in which each of the data is stored, a local data name of each of the data, and a global data name which is an unique identifier in all of said plurality of database systems;

said directory control unit receives an access request which specifies a global data name of target data of the access request, and identifies a database system and a local data name corresponding to the received global data name; and

said database control unit issues the identified database system with an access request which specifies the identified local data name, and accesses the target data of the access request.

3. An integrated database system according to claim 2, wherein:

said database server unit of each of said plurality

of database systems manages the data by using local data names which are unique identifiers in the database system in which said database server unit is included, and receives from said integrated database unit a request to access the data managed by the database server unit, in accordance with a specified local data name.

4. An integrated database system according to claim 1, wherein said integrated database unit serves as at least one of said plurality of database systems.

5. An integrated database unit which integrates a plurality of database systems connected to one another by a network, each of said plurality of database systems managing its own stored data independently of the other database systems and accessing the stored data in accordance with an access request, said integrated database unit being connected to the network, comprising:

a directory database which stores, as to each of the data stored in said plurality of database systems, a correspondence with directory information of the data and a database system in which the data concerned is stored;

a directory control unit which acquires, by using said directory database, directory information corresponding to target data of the accepted access request;

a database identifying unit which identifies, by using said directory data base, the database system corresponding to target data of the accepted access request; and

a database control unit which issues, on the basis of the acquired directory information, an access request to the database system having the target data of the accepted access request.

6. An integrated database unit according to claim 5, wherein:

said directory database stores correspondences between each of the data stored in the plural database systems and the database system in which each of the data is stored, a local data name of each of the data, and a global data name which is an unique identifier in all of said plurality of database systems;

said directory control unit receives an access request which specifies a global data name of target data of the access request, and identifies a database system and a local data name corresponding to the received global data name; and

said database control unit issues the identified database system with an access request which specifies the identified local data name, and accesses the target data of the access request.

7. A database access method for an integrated database system which includes a plurality of database systems connected to one another by a network, each of said plurality of database systems managing its own stored data independently of the other database systems and accessing the stored data in accordance with an access request, said database access method which accesses the data stored in said plurality of database systems, comprising the steps of:

in an integrated database unit which is connected to the network and includes a directory database which stores, as to each of the data stored in said plurality of database systems, a correspondence with directory information of the data and a database system in which the data concerned is stored,

acquiring, by using the directory database, directory information corresponding to target data of an accepted access request;

identifying, by using the directory database, the database system corresponding to target data of an accepted access request;

issuing, on the basis of the acquired directory information, an access request to the database system having the target data of the accepted access request; and

accessing a database in the database system in accordance with the access request issued by said

integrated database unit.

8. A database access method according to claim 7, further comprising the steps of:

in said integrated database unit in which said directory database stores correspondences between each of the data stored in the plural database systems and the database system in which each of the data is stored, a local data name of each of the data, and a global data name which is an unique identifier in all of said plurality of database systems,

receiving an access request which specifies a global data name of target data of the access request;

identifying a database system and a local data name corresponding to the received global data name; and

issuing the identified database system with an access request which specifies the identified local data name, and accessing the target data of the access request.

9. A database access method according to claim 8, wherein each of the database systems receives from said integrated database unit a request to access data managed by a database server unit, in accordance with a specified one of local data names which are managed by and are unique identifiers in the database system in which said database server unit is included.

10. A program product which causes a computer to execute access to data stored in a plurality of database systems, the computer constituting: the plurality of database systems connected to one another through a network, each of the plurality of database systems managing its own stored data independently of the other database systems and accessing the stored data in accordance with an access request; and an integrated database unit connected to the network, wherein:

said program product comprising:

a code which causes an integrated database unit connected to the network and including a directory database to acquire, by using said directory database, directory information corresponding to target data of an accepted access request, said directory database storing, as to each of the data stored in said plurality of database systems, a correspondence with the directory information of the data and a database system in which the data concerned is stored;

a code which causes said integrated database unit to identify, by using said directory database, a database system corresponding to target data of an accepted access request;

a code which causes said integrated database unit to issue, on the basis of the acquired directory information, an access request to said database system having the target

data of the accepted access request; and

a code which causes said database system to access a database in accordance with the access request issued by said integrated database unit.

11. A program product according to claim 10, further comprising:

a code which causes said integrated database unit to store, in said directory database, correspondences between each of the data stored in said plurality of database systems and the database system in which each of the data is stored, a local data name of each of the data, and a global data name which is an unique identifier in all of said plurality of database systems,

a code which causes said integrated database unit to receive an access request which specifies a global data name of target data of the access request;

a code which causes said integrated database unit to identify a database system and a local data name corresponding to the received global data name; and

a code which causes said integrated database unit to issue the identified database system with an access request which specifies the identified local data name, and accessing the target data of the access request.

12. A program product according to claim 11, further

comprising:

a code which causes each of said plurality of database systems to receive from said integrated database unit a request to access data managed by a database server unit, in accordance with a specified one of local data names which are managed by and are unique identifiers in the database system in which the database server unit is included.

13. A program product according to claim 10, wherein the computer which constitutes said database systems and said integrated database unit has a readable storage medium in which said codes are held.

14. A program product according to claim 10, wherein said codes are stored through the network into the computer which constitutes said database systems and said integrated database unit.

15. A storage medium which stores a program which causes a computer to execute access to data stored in a plurality of database systems, said computer constituting: said plurality of database systems connected to one another through a network, each of said plurality of database systems managing its own stored data independently of the other database systems and accessing the stored data in

accordance with an access request; and an integrated database unit connected to the network, wherein:

said program comprising:

a code which causes an integrated database unit connected to the network and including a directory database to acquire, by using the directory database, directory information corresponding to target data of an accepted access request, said directory database storing, as to each of the data stored in said plurality of database systems, a correspondence with the directory information of the data and a database system in which the data concerned is stored;

a code which causes said integrated database unit to identify, by using said directory database, a database system corresponding to target data of an accepted access request;

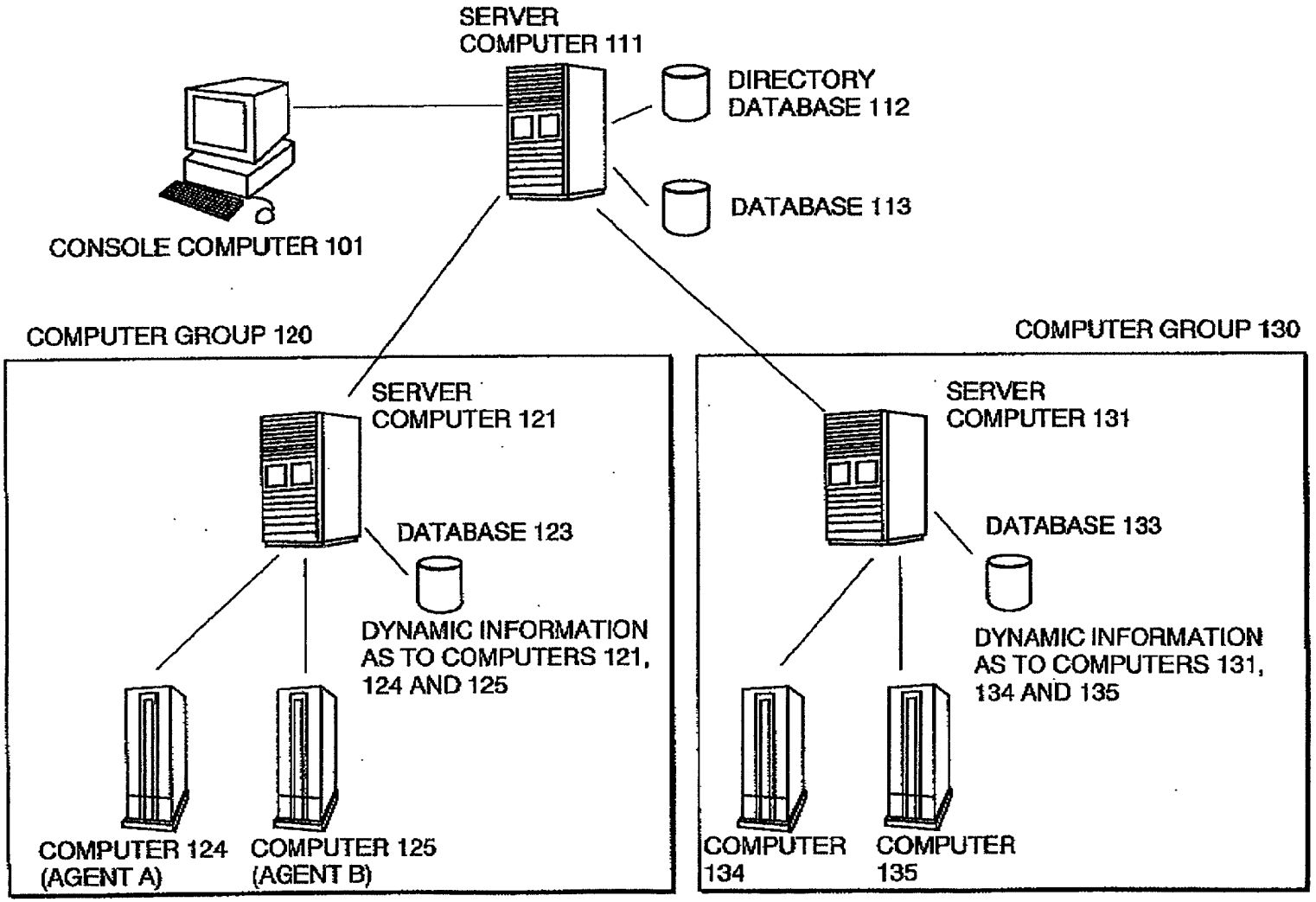
a code which causes said integrated database unit to issue, on the basis of the acquired directory information, an access request to the database system having the target data of the accepted access request; and

a code which causes the database system to access a database in accordance with the access request issued by said integrated database unit.

ABSTRACT

An integrated database system comprises a plurality of database systems connected to one another through a network, each of the plurality of database systems managing its own stored data independently of the other database systems and accessing the stored data in accordance with an access request, and an integrated database unit connected to the network. The integrated database unit includes a directory database which stores a correspondence between each of the data stored in the plurality of database systems and a database system in which each of the data is stored, a directory control unit which acquires, by using the directory database, directory information corresponding to target data of the accepted access request, a database identifying unit which identifies a database system, and a database control unit which issues, on the basis of the acquired directory information, an access request to the database system having the target data of the accepted access request. The database system includes a database server unit which accesses a database in accordance with the access request issued by the integrated database unit.

FIG.1


SERVER
COMPUTER 111
DIRECTORY
DATABASE 112
DATABASE 113
CONSOLE COMPUTER 101
COMPUTER GROUP 120
COMPUTER GROUP 130
SERVER
COMPUTER 121
DATABASE 123
DYNAMIC INFORMATION
AS TO COMPUTERS 121,
124 AND 125
SERVER
COMPUTER 131
DATABASE 133
DYNAMIC INFORMATION
AS TO COMPUTERS 131,
134 AND 135
COMPUTER 124
(AGENT A)
COMPUTER 125
(AGENT B)
COMPUTER
134
COMPUTER
135

0062307 "0062307"

FIG.2

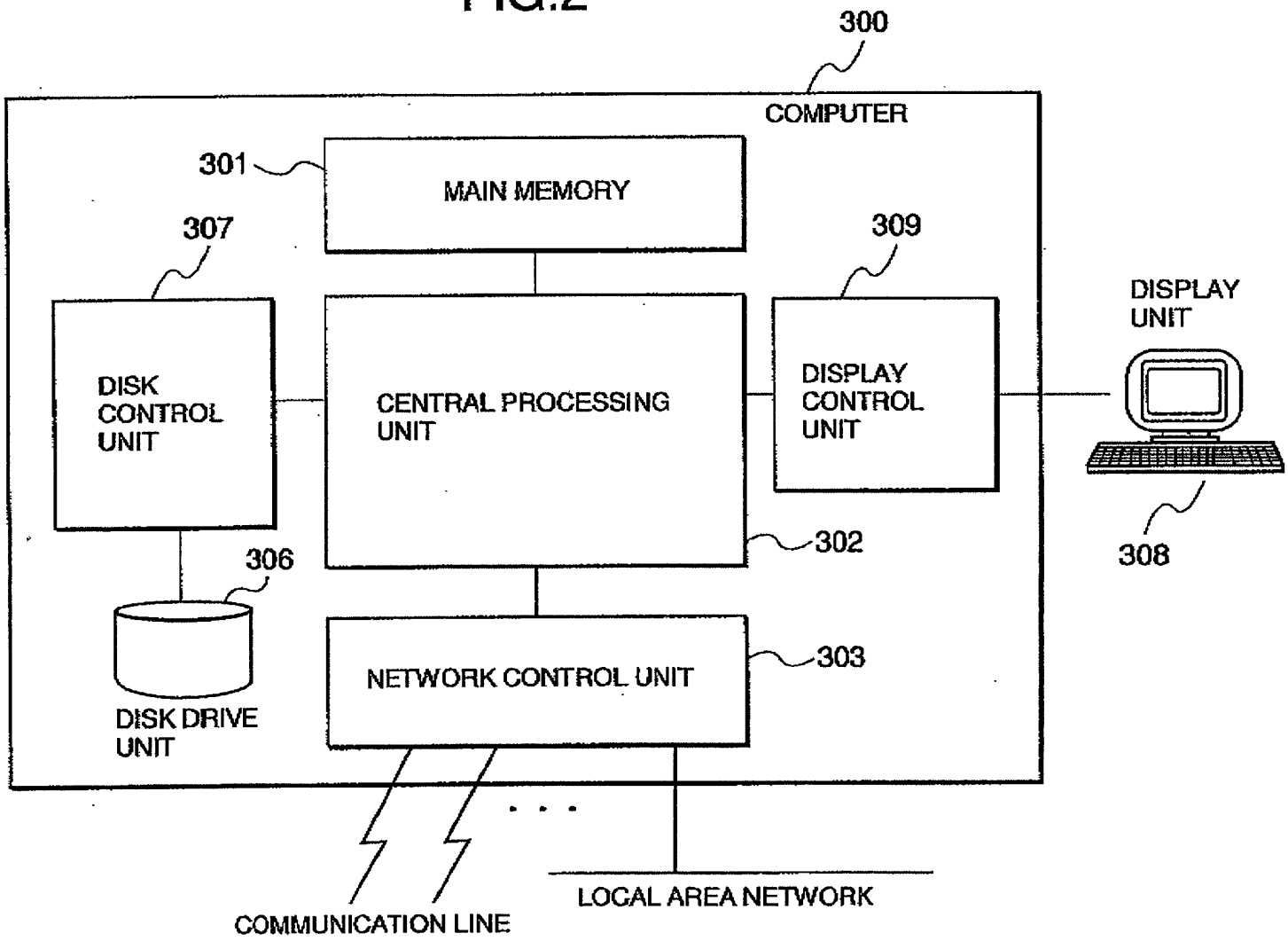


FIG.3

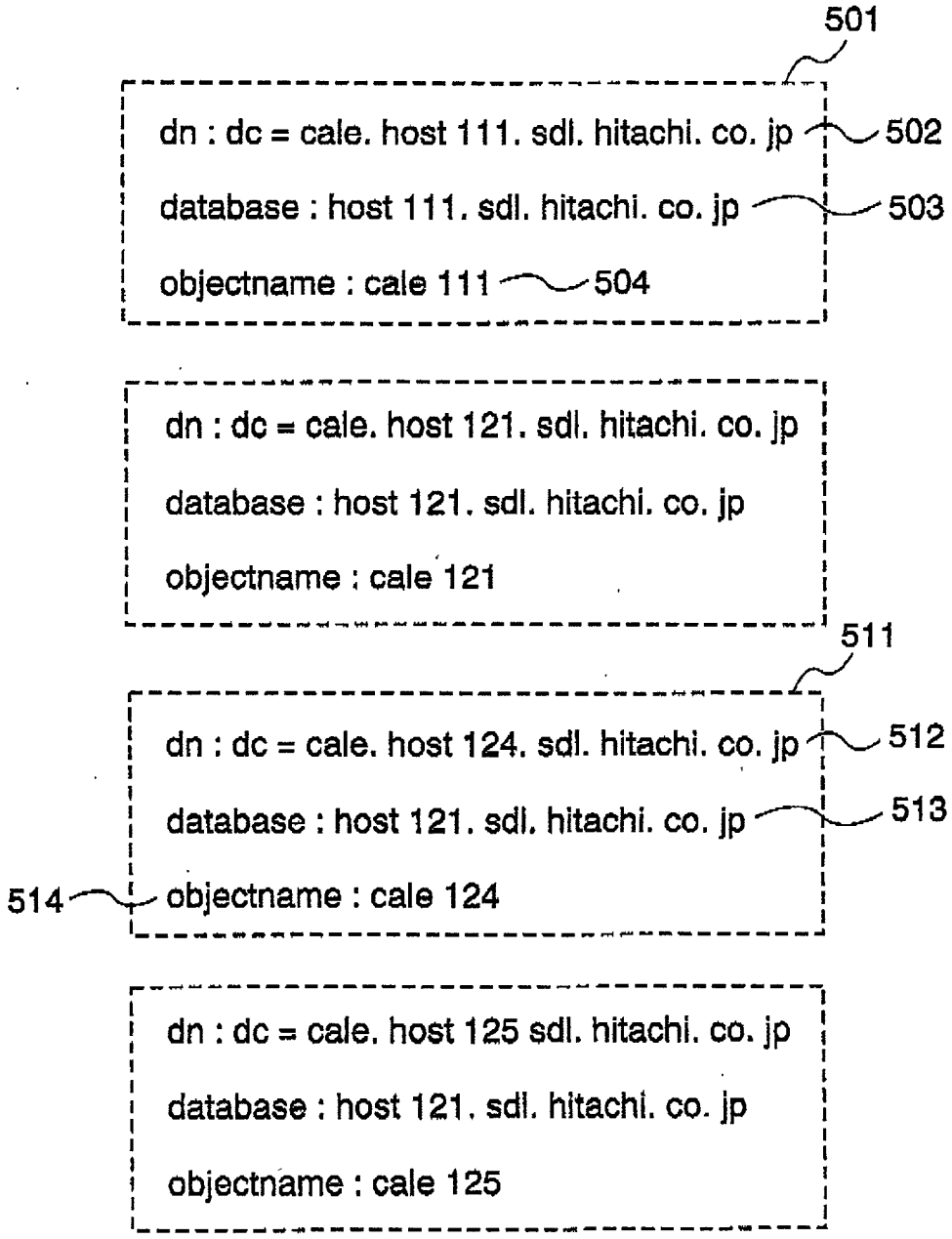

501
dn : dc = cale. host 111. sdl. hitachi. co. jp
502
database : host 111. sdl. hitachi. co. jp
503
objectname : cale 111
504
dn : dc = cale. host 121. sdl. hitachi. co. jp
database : host 121. sdl. hitachi. co. jp
objectname : cale 121
511
dn : dc = cale. host 124. sdl. hitachi. co. jp
512
database : host 121. sdl. hitachi. co. jp
513
514
objectname : cale 124
dn : dc = cale. host 125 sdl. hitachi. co. jp
database : host 121. sdl. hitachi. co. jp
objectname : cale 125

FIG.4

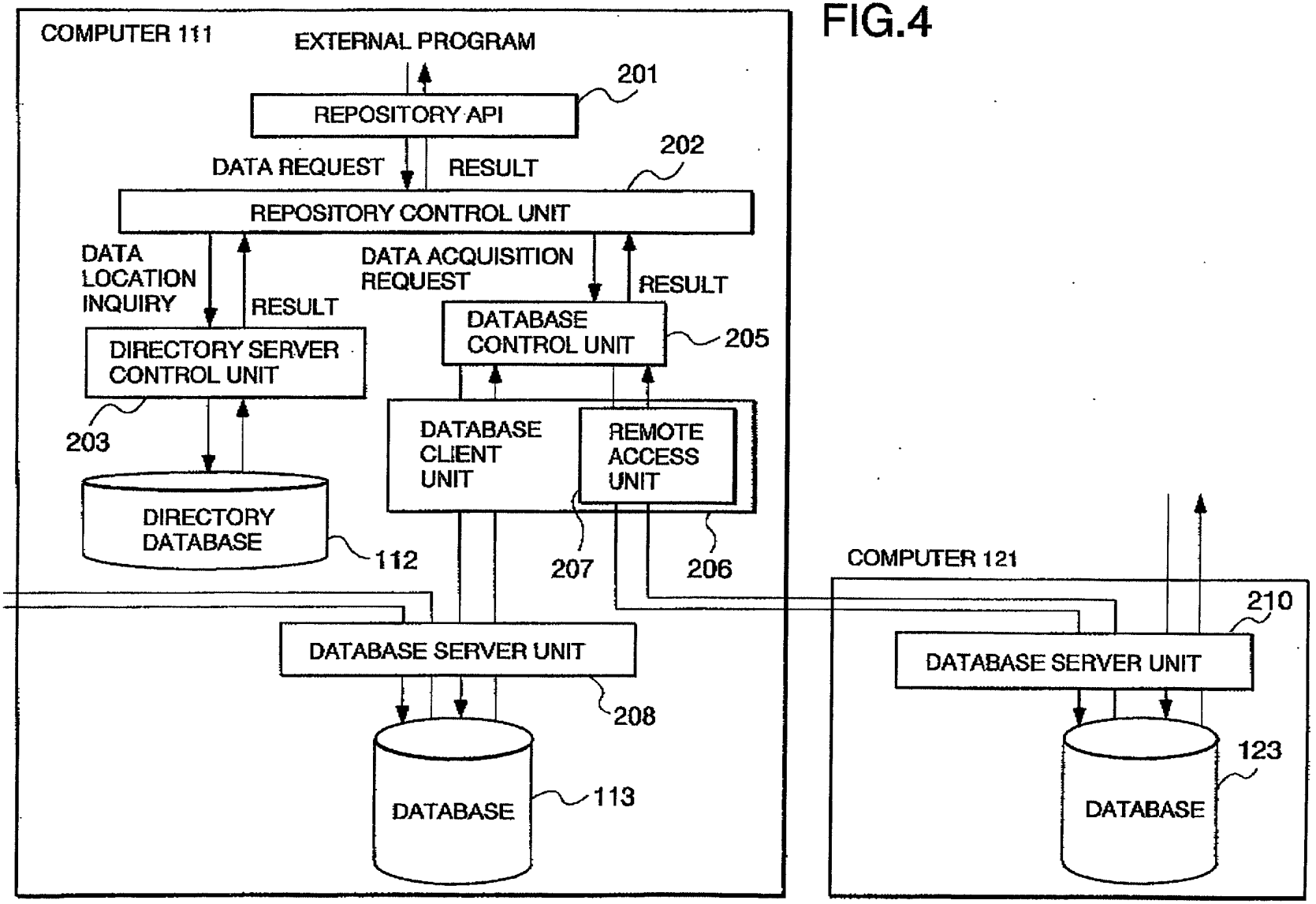

COMPUTER 111
EXTERNAL PROGRAM
201
REPOSITORY API
DATA REQUEST
RESULT
202
REPOSITORY CONTROL UNIT
DATA LOCATION INQUIRY
RESULT
DATA ACQUISITION REQUEST
RESULT
DATABASE CONTROL UNIT
205
DIRECTORY SERVER CONTROL UNIT
203
DATABASE CLIENT UNIT
REMOTE ACCESS UNIT
DIRECTORY DATABASE
112
207
206
COMPUTER 121
210
DATABASE SERVER UNIT
208
DATABASE SERVER UNIT
123
DATABASE
113
DATABASE

FIG.5

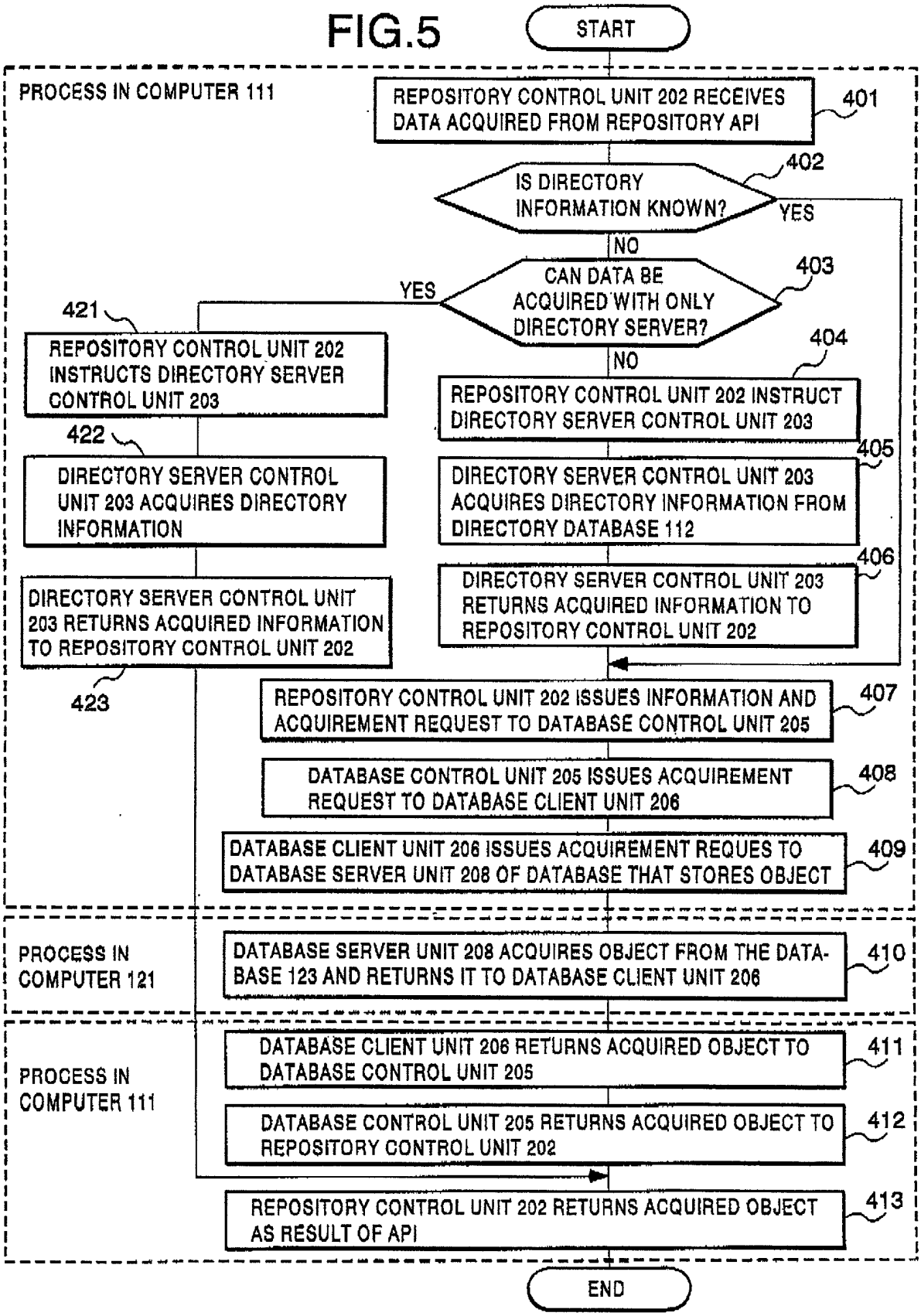
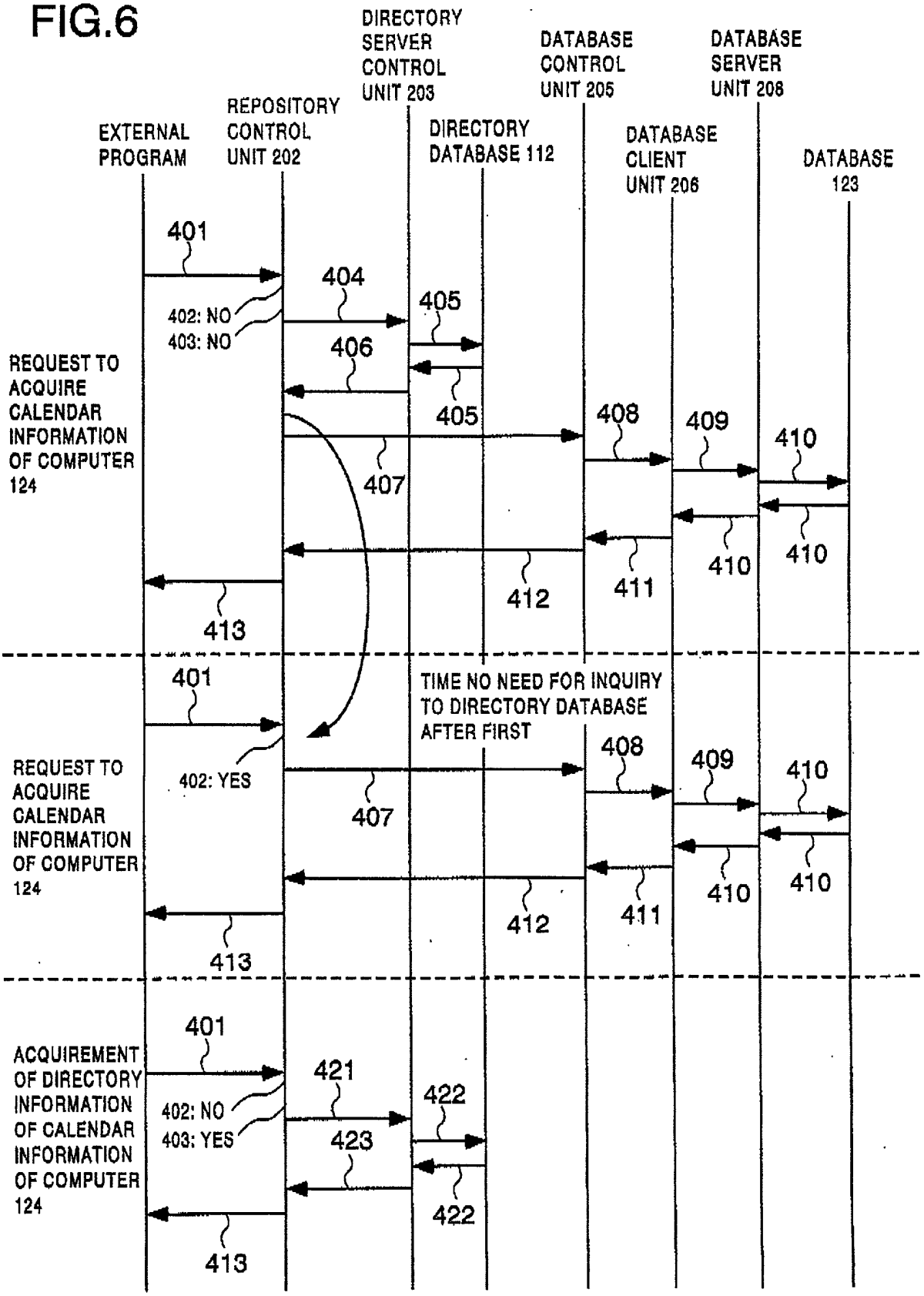

START
PROCESS IN COMPUTER 111
REPOSITORY CONTROL UNIT 202 RECEIVES DATA ACQUIRED FROM REPOSITORY API
401
IS DIRECTORY INFORMATION KNOWN?
402
YES
NO
CAN DATA BE ACQUIRED WITH ONLY DIRECTORY SERVER?
403
YES
421
REPOSITORY CONTROL UNIT 202 INSTRUCTS DIRECTORY SERVER CONTROL UNIT 203
422
DIRECTORY SERVER CONTROL UNIT 203 ACQUIRES DIRECTORY INFORMATION
DIRECTORY SERVER CONTROL UNIT 203 RETURNS ACQUIRED INFORMATION TO REPOSITORY CONTROL UNIT 202
423
NO
404
REPOSITORY CONTROL UNIT 202 INSTRUCT DIRECTORY SERVER CONTROL UNIT 203
405
DIRECTORY SERVER CONTROL UNIT 203 ACQUIRES DIRECTORY INFORMATION FROM DIRECTORY DATABASE 112
406
DIRECTORY SERVER CONTROL UNIT 203 RETURNS ACQUIRED INFORMATION TO REPOSITORY CONTROL UNIT 202
REPOSITORY CONTROL UNIT 202 ISSUES INFORMATION AND ACQUIREMENT REQUEST TO DATABASE CONTROL UNIT 205
407
DATABASE CONTROL UNIT 205 ISSUES ACQUIREMENT REQUEST TO DATABASE CLIENT UNIT 206
408
DATABASE CLIENT UNIT 206 ISSUES ACQUIREMENT REQUES TO DATABASE SERVER UNIT 208 OF DATABASE THAT STORES OBJECT
409
PROCESS IN COMPUTER 121
DATABASE SERVER UNIT 208 ACQUIRES OBJECT FROM THE DATA-BASE 123 AND RETURNS IT TO DATABASE CLIENT UNIT 206
410
PROCESS IN COMPUTER 111
DATABASE CLIENT UNIT 206 RETURNS ACQUIRED OBJECT TO DATABASE CONTROL UNIT 205
411
DATABASE CONTROL UNIT 205 RETURNS ACQUIRED OBJECT TO REPOSITORY CONTROL UNIT 202
412
REPOSITORY CONTROL UNIT 202 RETURNS ACQUIRED OBJECT AS RESULT OF API
413
END

FIG.6


EXTERNAL PROGRAM
REPOSITORY CONTROL UNIT 202
DIRECTORY SERVER CONTROL UNIT 203
DIRECTORY DATABASE 112
DATABASE CONTROL UNIT 205
DATABASE CLIENT UNIT 206
DATABASE SERVER UNIT 208
DATABASE 123
REQUEST TO ACQUIRE CALENDAR INFORMATION OF COMPUTER 124
401
402: NO
403: NO
404
405
406
407
408
409
410
411
412
413
TIME NO NEED FOR INQUIRY TO DIRECTORY DATABASE AFTER FIRST
402: YES
ACQUIREMENT OF DIRECTORY INFORMATION OF CALENDAR INFORMATION OF COMPUTER 124
403: YES
421
422
423

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

COMBINED DECLARATION, POWER OF ATTORNEY & PETITION

TYPE OF DECLARATION

[X] Utility
[ ] Design
[ ] Supplemental
[ ] Divisional
[ ] Continuation
[ ] Continuation-in-part
[ ] National Stage of the PCT

INVENTORSHIP AND SPECIFICATION IDENTIFICATION

My residence, post office address and citizenship are as stated below next to my name; I believe I am the original, first and sole inventor (if only one is listed below) or a joint inventor (if plural inventors are named below) for which a patent is sought on the design entitled:

INTEGRATED DATABASE SYSTEM AND METHOD FOR ACCESSING A PLURALITY OF DATABASES

as described and claimed in the specification which
[X] is attached hereto.
[ ] was filed on _
[ ] as U.S. Serial Number. ____ ; or
[ ] Express Mail No._____ (as serial number not yet known); and
[ ] was amended on _____ .
[ ] was described and claimed in PCT International Application No. PCT/ / _____
filed on _____ ; and
☐ as amended under PCT Article 19 and/or 34 on _____ .

REVIEW OF PAPERS AND DUTY OF CANDOR

I have reviewed and understand the contents of the attached specification including the drawing and claims as amended by any amendment referred to below; and
I acknowledge my duty to disclose information of which I am aware which is material to the examination of this application, in accordance with 37 CFR 1.56(a); and

☐ in compliance with this duty there is attached an information disclosure statement.

PRIORITY CLAIMS

I hereby claim **foreign priority** benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign applications for patent applications for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)			Priority Claimed	
11-176412	Japan	23 June 1999	[X] Yes	[ ] No
(Number)	(Country)	(Day/Month/Year/Filed)		
_____	_____	_____	[ ] Yes	[ ] No
(Number)	(Country)	(Day/Month/Year/Filed)		
_____	_____	_____	[ ] Yes	[ ] No
(Number)	(Country)	(Day/Month/Year/Filed)		

I hereby claim the benefit under Title 35, United States Code, § 120 of any **United States Application(s)** listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States Application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

(Application Serial No.)	(Filing Date)	(Status: Patented, Pending, Abandoned)
_____	_____	_____
(Application Serial No.)	(Filing Date)	(Status: Patented, Pending, Abandoned)

DECLARATION

I declare that all statements made above of my own knowledge are true and all statements made on information and belief are believed to be true; and these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and such

willful false statements may jeopardize the validity of the application or any patent issuing thereon.

POWER OF ATTORNEY

I hereby appoint the following patent attorneys and/or patent agent(s) with full power of appointment, substitution and revocation to prosecute this application, to make alterations and amendments thereto, to receive the patent, and to transact all business in the Patent Office connected therewith.

Joseph Sofer (Reg. No. 34,438)
Robert M. Haroun (Reg. No. 34,345)
Thomas C. Hughes (Reg. No. 42,674)
David I. Greenbaum (Reg. No. P-46,739)

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PETITION

Wherefore, I pray that Letters Patent be granted to me for the invention or discovery described and claimed in the above-mentioned specification and claims, and I hereby subscribe my name to the foregoing Declaration, Power of Attorney & Petition with references to the above-identified specification and claims.

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Inventor's Signature: _____ **Date:** _____

Declaration and Power of Attorney